



VERIFIED: A web-based tool to assess potential airspace constraint from operationally-relevant forecast products

Geary Layne¹, Paul Hamer², Michael Kay¹, Matthew Wandishin¹, Missy Petty²,
Steve Lack¹, Joan Hart¹, Jennifer Mahoney

NOAA Research — Earth System Research Laboratory, Boulder CO

¹Cooperative Institute for Research in Environmental Sciences (CIRES), Boulder, CO

²Cooperative Institute for Research in the Atmosphere(CIRA), Fort Collins, CO

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1. Introduction

The Forecast Impact and Quality Assessment Section of NOAA's Earth System Research Laboratory with support from the NWS NextGen Program is prototyping an integrated decision support system (IDSS) where weather forecast information is translated into operationally-relevant attributes and used to develop a common weather platform for aviation Air Traffic Management (ATM) decision-making and planning.

2. Approach

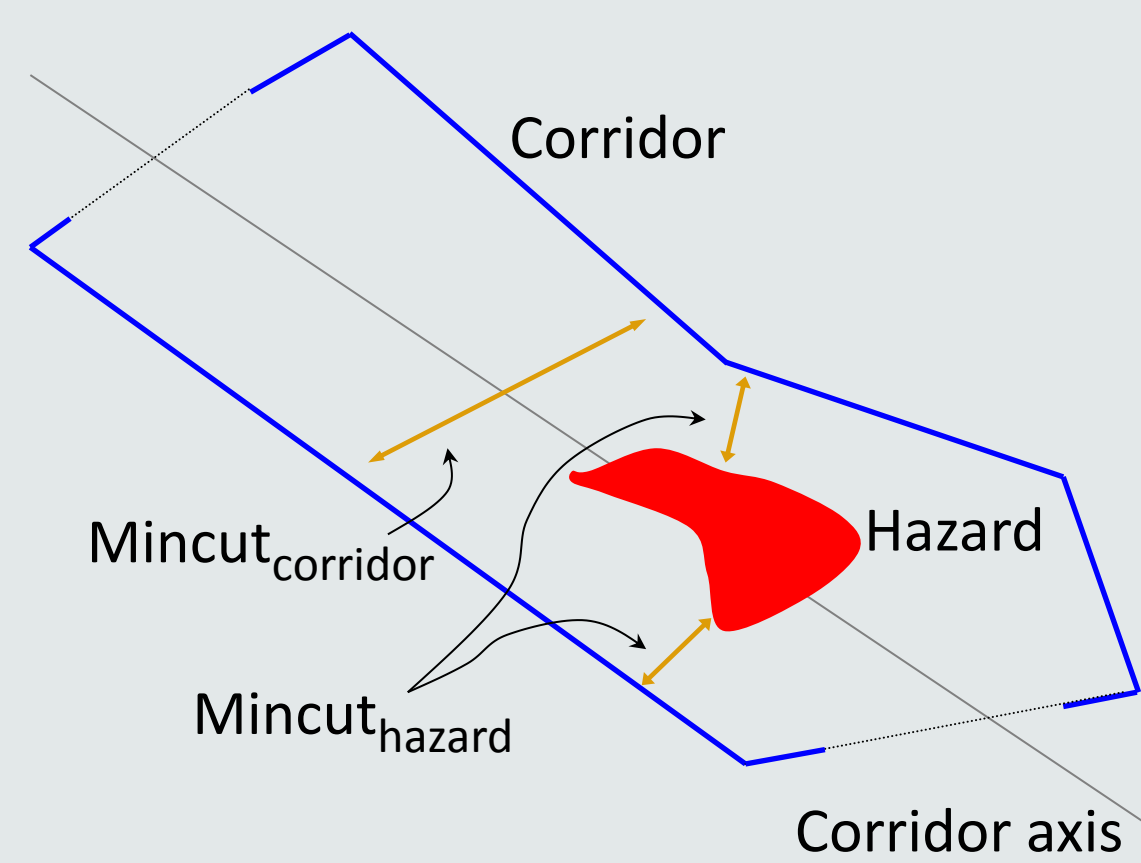
Develop a prototype that is designed to support the key functions of the operational bridging forecaster:

- Maintain awareness of observed meteorological conditions
- Provide measures of accuracy of and the confidence in the existing weather prediction forecasts
- Validate or adjust existing aviation weather forecasts in a timely manner.

3. IDSS Foundations

The VERIFIED IDSS is built on several foundational principles, including:

A. Translating the forecast information using metrics aligned with operational procedures.



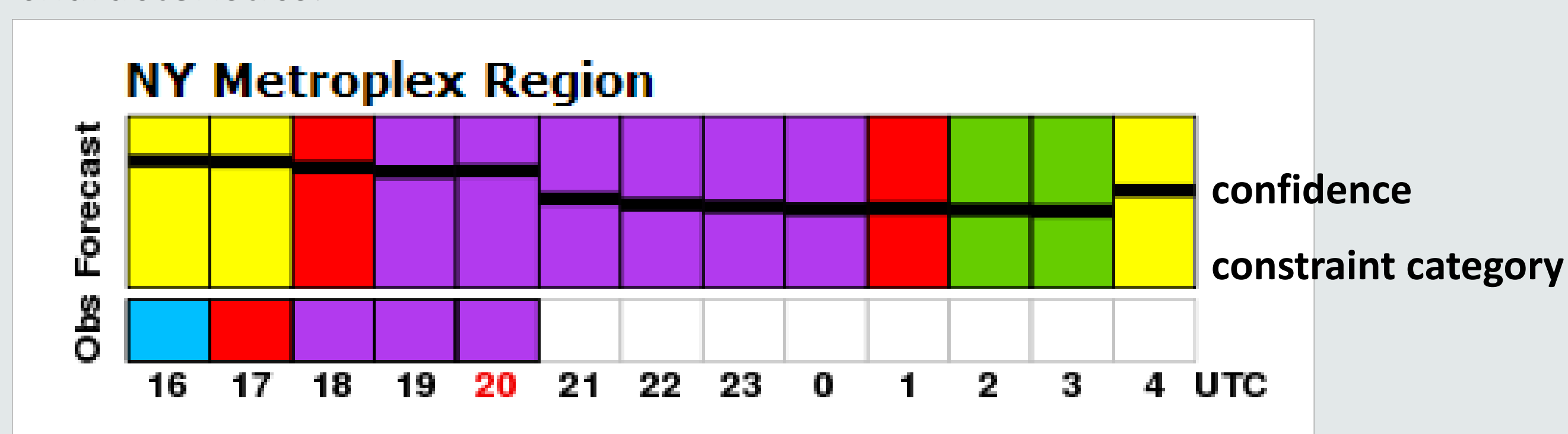
All forecasts are translated into a measure of airspace constraint determined by the Flow Constraint Index (FCI), the ratio of corridor capacity in the presence of a hazard (e.g., thunderstorm) to the capacity under clear conditions.

$$FCI = 1 - \frac{mincut_{hazard}}{mincut_{corridor}}$$

B. Providing Forecast Confidence

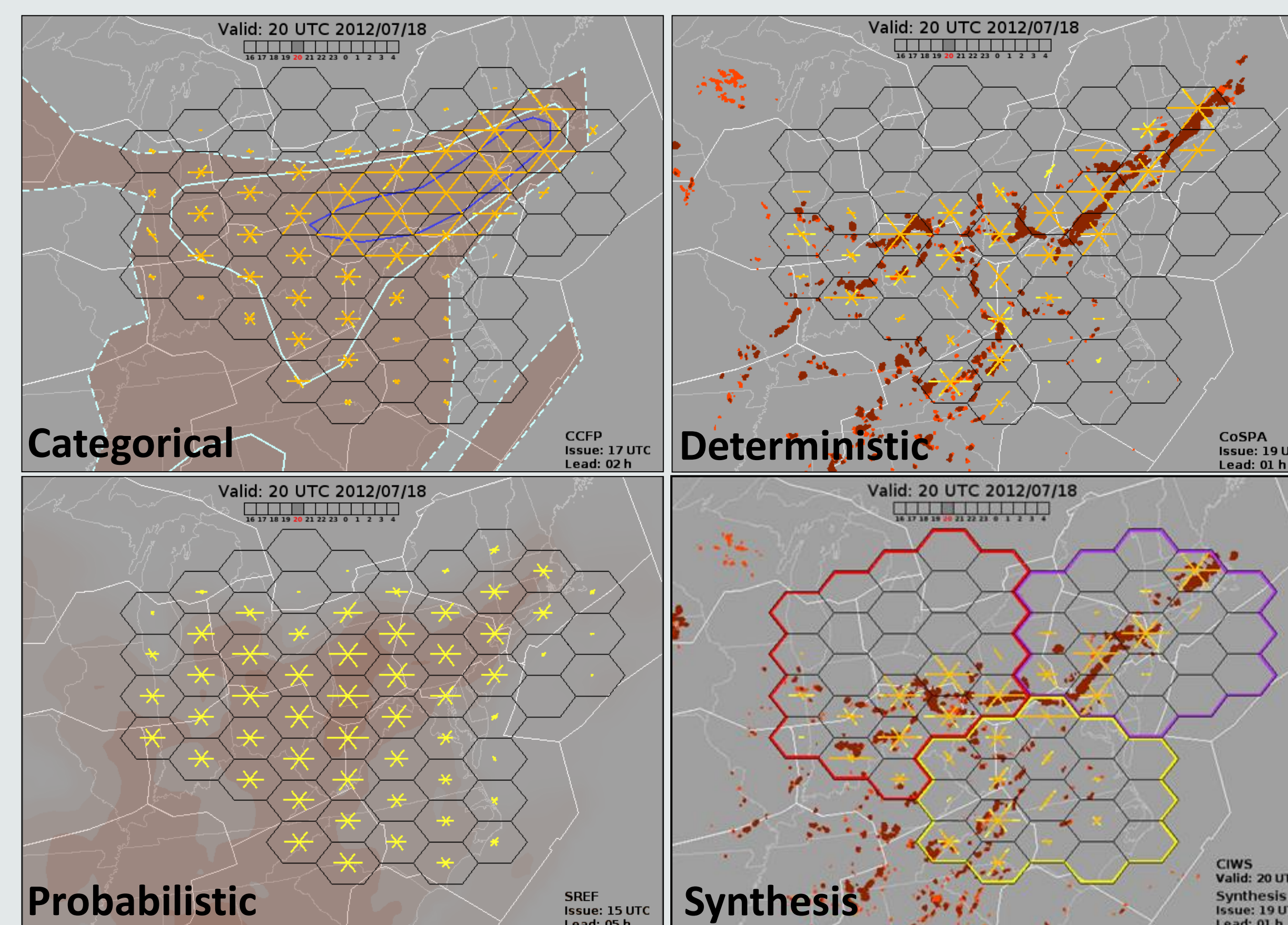
Confidences can be provided for each forecast by combining information on the long-term historical performance together with measures of recent forecast performance, intra-model consistency, and difficulty of the weather scenario.

The confidence is displayed together with a time series of color-coded airspace constraints. Constraint is determined by aggregating over a set of corridors within a larger-scale region, based on general air traffic flow characteristics.



C. Synthesizing multiple forecast products into a single, unified view of weather with respect to airspace operations.

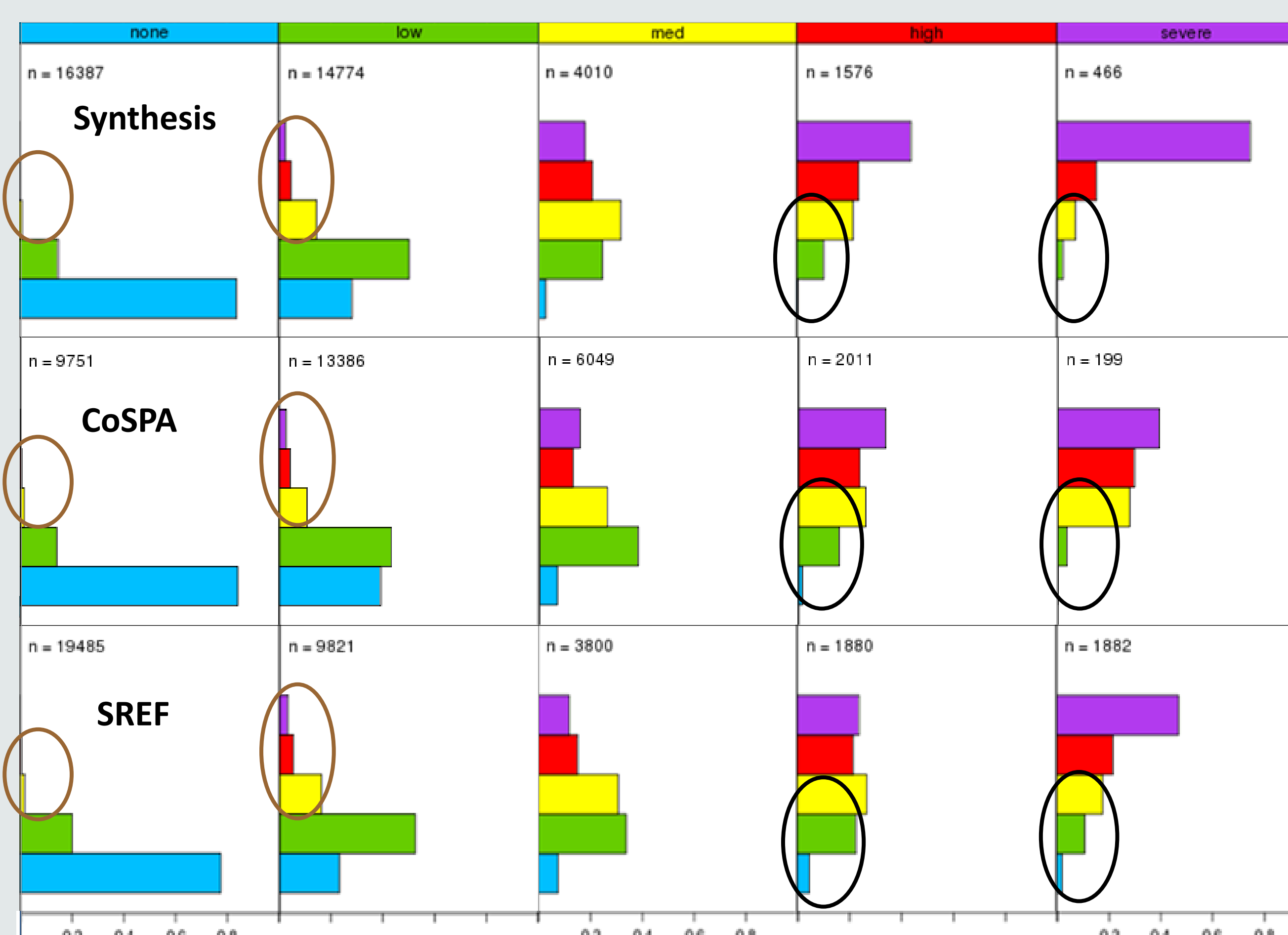
Translating the forecast to a common framework allows forecasts of different types to be meaningfully combined into a synthesis of forecast constraint, where the relative weights for the constituent forecasts are determined by the confidences.



Example plots of the three constituent forecasts and their synthesis. Yellow and orange stars represent the constraint (FCI values) for flow across opposing faces of the hexagons. Red shading represents the forecasts of convection. For the Synthesis, the red shading represents the observed convective activity while colored region outlines show the constraint within each region.

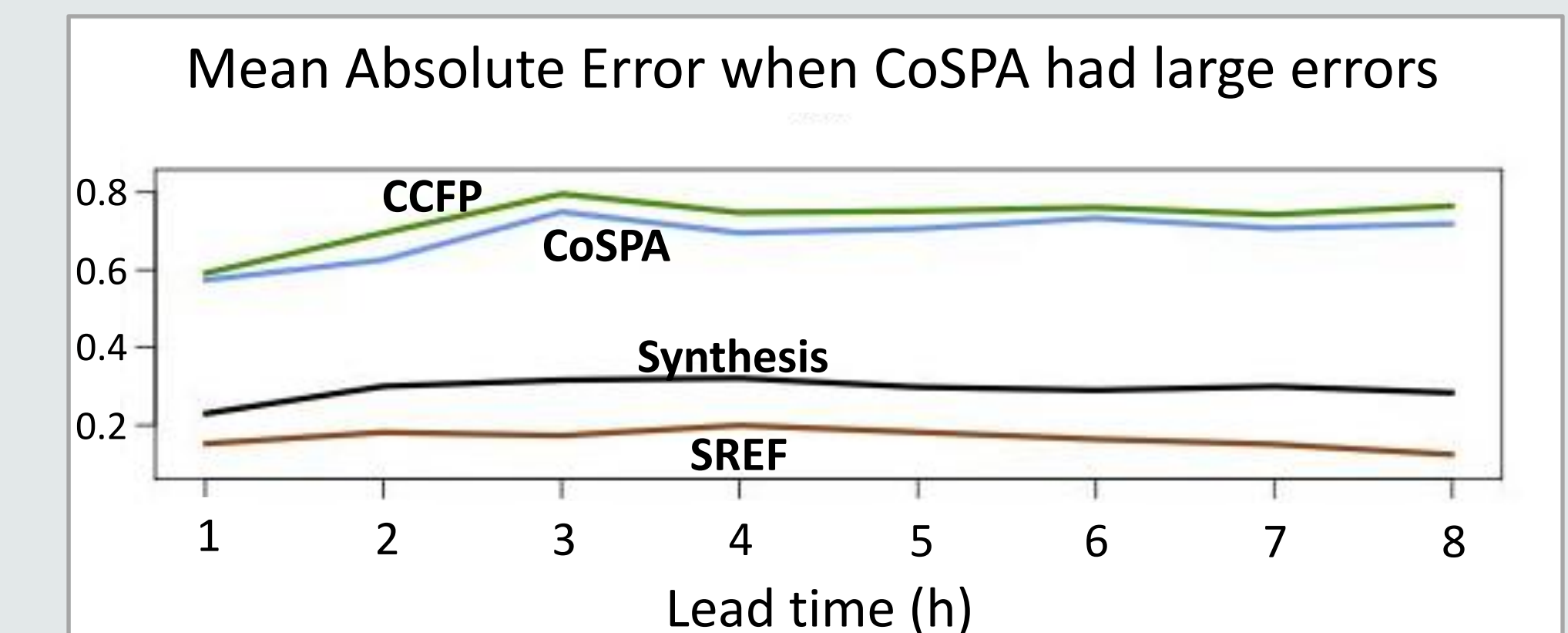
4. Forecast Verification

Conditional frequencies show the distribution of observed constraint (horizontal bars) given a particular forecast category (columns).

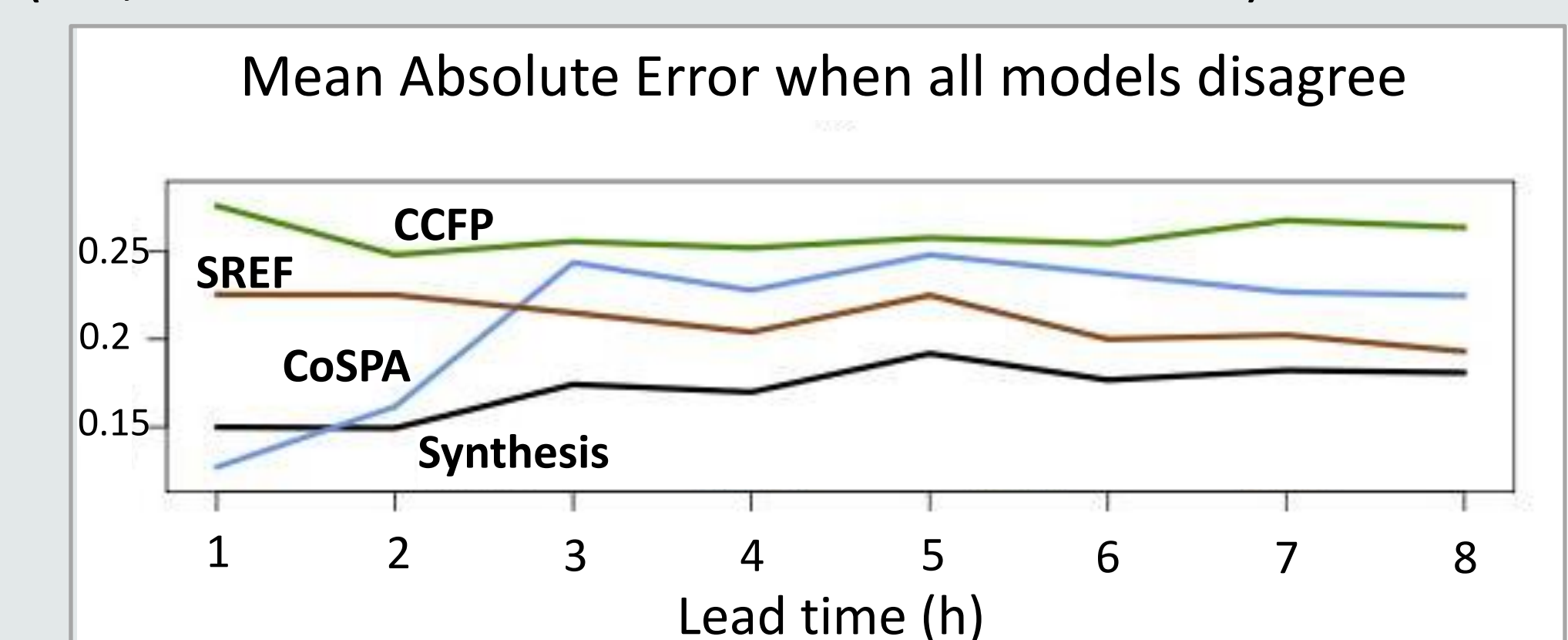


- Synthesis reduces the number of higher constraint cases for its 'none' and 'low' forecasts (compare within brown ovals)
- Synthesis reduces the number of lower constraint cases for its 'high' and 'severe' forecasts (compare within black ovals)
- As a result, Synthesis forecasts are more reliable

In addition, the Synthesis is able to maintain accuracy even when one of the constituent forecasts performs poorly.

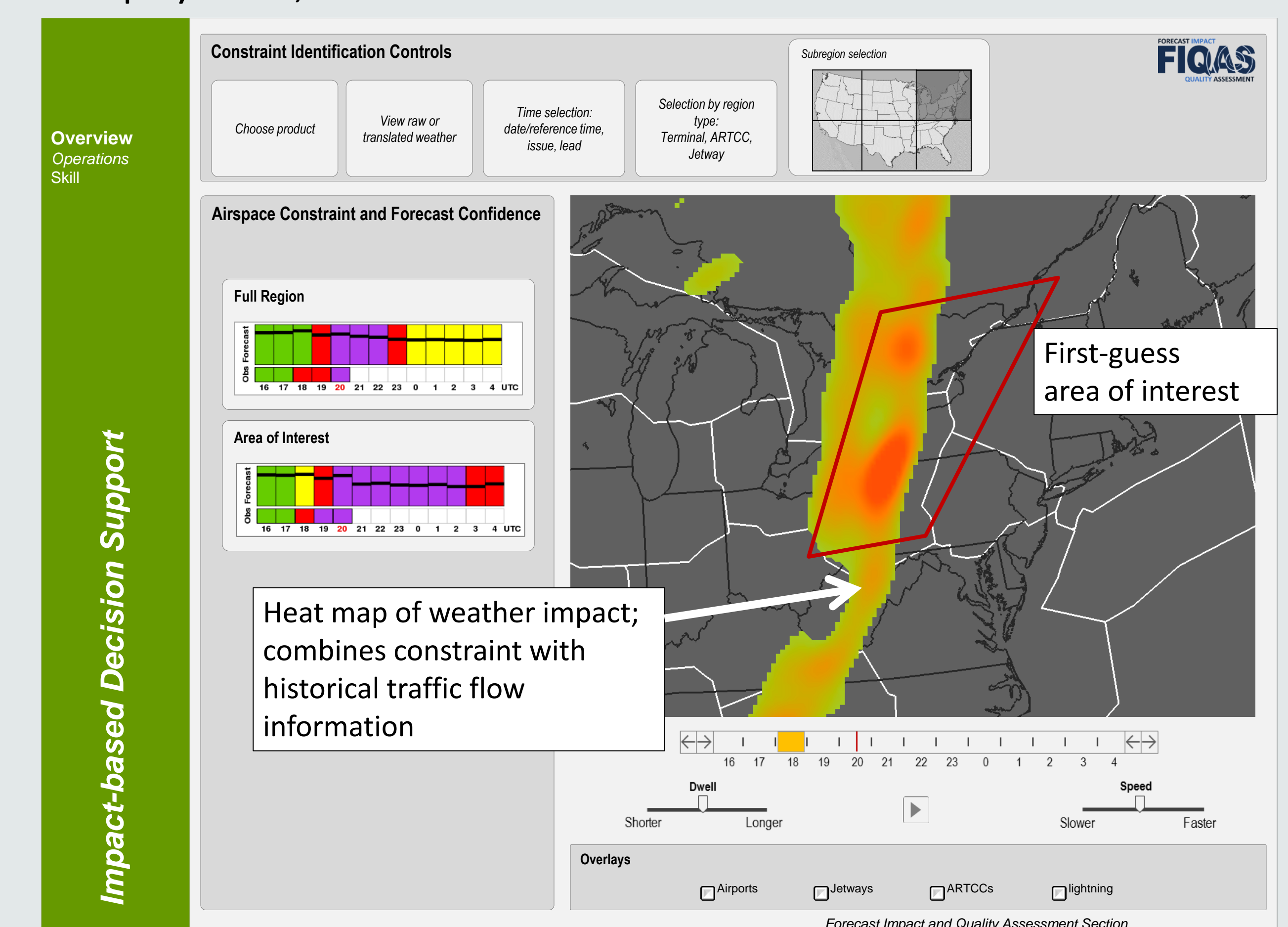


Synthesis is more accurate when constituent forecasts disagree with each other (i.e., under more uncertain weather scenarios)



5. Summary and Future Plans

- The VERIFIED IDSS webpage was available in June 2012 at the Aviation Weather Center Testbed for the Operational Bridging Dry Run and through the summer and early fall of 2012 to the National Aviation Meteorologists to assist in the generation of Aviation Weather Statements.
- Updated version of the IDSS will be available during the summer of 2013. Changes include:
 - Move from hexagons to jet route segments for constraint calculations
 - Shift from static to dynamic region summaries of constraint, possibly user-drawn regions
 - Provide a separate view of information relative to jet routes, playbooks, and terminals



More Information

For links to other projects and additional information, see the FIQAS homepage: <http://esrl.noaa.gov/fiqas/>